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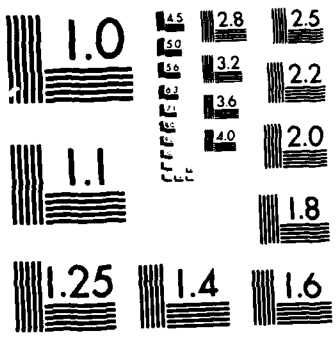

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TECHNICAL REPORT A-78-2

LARGE-SCALE OPERATIONS MANAGEMENT TEST OF USE OF THE WHITE AMUR FOR CONTROL OF PROBLEM AQUATIC PLANTS

Report 4

THIRD YEAR POSTSTOCKING RESULTS

Volume VI

The Water and Sediment Quality of Lake Conway, Florida

By H. Douglas Miller, James Boyd

Miller & Miller, Inc.
Orlando, Fla. 32801

January 1983

Report 4 of a Series

Prepared for U. S. Army Engineer District, Jacksonville
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Washington, D. C. 20314

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Monitored by Environmental Laboratory
U. S. Army Engineer Waterways Experiment Station
P. O. Box 631, Vicksburg, Miss. 39180

LARGE-SCALE OPERATIONS MANAGEMENT TEST OF
USE OF THE WHITE AMUR FOR CONTROL OF
PROBLEM AQUATIC PLANTS

Report 1: Baseline Studies

Volume I: The Aquatic Macrophytes of Lake Conway, Florida

Volume II: The Fish, Mammals, and Waterfowl of Lake Conway, Florida

Volume III: The Plankton and Benthos of Lake Conway, Florida

Volume IV: Interim Report on the Nitrogen and Phosphorus Loading Characteristics of the Lake Conway, Florida, Ecosystem

Volume V: The Herpetofauna of Lake Conway, Florida

Volume VI: The Water and Sediment Quality of Lake Conway, Florida

Volume VII: A Model for Evaluation of the Response of the Lake Conway, Florida, Ecosystem to Introduction of the White Amur

Volume VIII: Summary of Baseline Studies and Data

Report 2: First Year Poststocking Results

Report 3: Second Year Poststocking Results

Report 4: Third Year Poststocking Results

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Ecosystems	White amur

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report presents the results of the third annual poststocking period covering the 12-month period from September 1979-August 1980. The data collected during this period are compiled herein in a format similar to that used for the baseline report and the two previous poststocking reports. The compiled poststocking data are compared to the baseline conditions to determine if any significant changes have occurred as a result of the introduction of the white amur into Lake Conway.

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20. ABSTRACT (Continued).

The baseline report established certain factors for future data comparisons: water quality variations between the five major lake pools, phytoplankton and nutrient relationships, and seasonal variations in water quality. These factors are reviewed in this report, and changes that have occurred in relation to the baseline period are documented and discussed. In addition, the trend of certain water quality parameters established subsequent to the introduction of the white amur is noted.

Since the baseline and poststocking periods were of different time lengths, a certain degree of seasonal bias existed between the baseline and poststocking periods. This bias was accounted for in the first poststocking report; thus, the resulting adjusted baseline values were used in making comparisons in this report.

In order that proper comparisons could be made with results derived in previous reports, any variation in parameter concentration as a function of depth was ignored when calculating the mean concentration of the various water quality constituents with the exception of pH, dissolved oxygen, turbidity, and chlorophyll-a.

The baseline report established that a trend of decreasing water quality (increasing concentrations of nutrients, minerals, and chlorophyll-a) existed when proceeding from the South pool of Lake Conway to Lake Gatlin. The first and second poststocking reports noted that this trend appeared to change in that South, Middle, East, and West pools showed a tendency toward similar water quality conditions. This equalization of water quality appeared to continue during this period. However, as in the baseline period, Lake Gatlin continued to exhibit the poorest water quality of the five major pools.

Comparing the third poststocking water quality data to the baseline period, nine parameters were identified as demonstrating substantial changes in mean concentration levels: total filterable phosphorus, total unfilterable phosphorus, organic nitrogen, carotenoids, volatile suspended solids, biochemical oxygen demand, chemical oxygen demand, chlorophyll-a, and ammonia nitrogen.

Seasonal trends established during the baseline period were evaluated based on the poststocking data. As noted during the baseline period, total phosphorus concentrations showed less seasonal variation. Temperature and chlorophyll-a followed similar seasonal patterns, while organic nitrogen exhibited a dissimilar trend when compared to the baseline period, with greater seasonal fluctuations evident.

Subsequent to the introduction of the white amur, both total filterable and total unfilterable phosphorus underwent significant downward trends that presently appear to be becoming stable. Conversely, the gradual upward trend of chlorophyll-a continued during this period.

Sediment quality data showed several changes from the baseline period. The mean total phosphorus concentration decreased 56 percent as compared to the baseline period. Conversely, mean copper and lead concentrations increased above baseline values.

PREFACE

This report was prepared in accordance with modification No. DACW39-76-C-0084-P006, Supplemental Agreement, to Contract No. DACW39-76-C-0084 negotiated between the Orange County Pollution Control Board, Orlando, Fla., and the U. S. Army Engineer Waterways Experiment Station (WES), Vicksburg, Miss.

Mr. Raymond T. Kaleel, Orange County Pollution Control Department, served as Project Manager for this report; the Orange County Pollution Control Department Staff were responsible for data collection; Mr. James Boyd, Miller & Miller, Inc., assisted in the report preparation; and Mr. H. Douglas Miller, Miller & Miller, Inc., was in charge of report preparation.

The work was monitored by the WES Environmental Laboratory (EL), Dr. John Harrison, Chief. Mr. J. Lewis Decell was Manager of the Aquatic Plant Control Research Program, EL. The study was under the general supervision of Mr. Bob O. Benn, Chief, Environmental Systems Division (ESD), EL. Principal investigators at WES for the study were: Mr. Russell F. Theriot, Mr. John Lunz, Mr. Eugene G. Buglewicz, and Dr. Andrew C. Miller, all of the ESD, EL.

Commanders and Directors of WES during conduct of the study and preparation of the report were COL John L. Cannon, CE, COL Nelson P. Conover, CE, and COL Tilford C. Creel, CE. Technical Director was Mr. F. R. Brown.

This report should be cited as follows:

> Miller, H. D., and Boyd, J. 1983. "Large-Scale Operations Management Test of Use of the White Amur for Control of Problem Aquatic Plants; Report 4, Third Year Poststocking Results; Volume VI: The Water and Sediment Quality of Lake Conway, Florida," Technical Report A-78-2, prepared by Miller & Miller, Inc., Orlando, Fla., for the U. S. Army Engineer Waterways Experiment Station, CE, Vicksburg, Miss.

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LARGE-SCALE OPERATIONS MANAGEMENT TEST OF USE OF THE WHITE AMUR FOR CONTROL OF PROBLEM AQUATIC PLANTS

THIRD YEAR POSTSTOCKING RESULTS

The Water and Sediment Quality of Lake Conway, Florida

PART I: INTRODUCTION

1. The U. S. Army Engineer Waterways Experiment Station (WES) has been conducting a Large-Scale Operations Management Test (LSOMT) since January 1976 concerning the introduction of the white amur fish (*Ctenopharyngodon idella*) into Lake Conway, Florida, to control the aquatic plant hydrilla (*Hydrilla verticillata*). Through contract with WES, the Orange County Pollution Control Department has the responsibility for monitoring water and sediment quality and regularly reporting the test results to WES.

2. To define baseline conditions in Lake Conway prior to introduction of the white amur, a 20-month testing period from January 1976-August 1977 was undertaken. In order to describe and document these baseline conditions, a baseline data report was prepared and submitted to WES. A main objective of the baseline report was to process the large volume of data into a format that would enable future comparisons to be readily made to baseline conditions. For this purpose, certain statistical data reduction procedures were used, including mean values and standard deviations. Also, sampling depth was eliminated as a discriminating factor when little or no variation (less than or equal to 5 percent) existed between sampling depths for a given parameter.

3. Subsequent to completion of the baseline study (Report 1 of this series), two poststocking reports were prepared and submitted to WES. The first poststocking report (Report 2 of this series) evaluated the first 12 months of the poststocking period, September 1977-August 1978, while the second poststocking report (Report 3 of this series) evaluated the second 12 months, September 1978-August 1979. In order for meaningful comparisons to be made, both poststocking reports

followed the same format as the baseline report. A major emphasis of both poststocking reports was the identification of changes that occurred during poststocking periods as compared to baseline conditions. Specifically, the baseline report noted certain factors that were compared to the poststocking conditions. These factors included variations in data between lake pools, seasonal changes in water and sediment quality, nutrient and productivity levels, and community succession.

4. This report evaluates the third 12 months of the poststocking period, September 1979-August 1980. Data collected during this period are analyzed and presented in a manner similar to the baseline report and the previous poststocking reports, with particular attention being focused on changes and trends in the various water and sediment quality parameters.

PART II: POSTSTOCKING DATA COMPILATION AND ANALYSIS SEPTEMBER 1979-AUGUST 1980

Water Quality

Data compilation

5. As previously mentioned, for comparison purposes the poststocking data presented in this report have been compiled in a format similar to the baseline report and the previous two poststocking reports. Table 1 lists those parameters usually found in concentrations below equipment detection limits. Inspection of the data indicates that the concentration of most parameters did not exceed 5 percent variation as a function of depth, and, since all data in previous reports were analyzed regardless of depth, data collected during this period will be processed in a similar fashion so that similar comparisons can be made. Tables 2-12 present mean values and standard deviations for the 12-month poststocking period as calculated for each of the 11 sampling stations shown in Figure 1. The mean value and standard deviation for various parameters as calculated for the 11 stations combined are listed in Table 13.

6. In the baseline data report, dissolved oxygen (DO), pH, turbidity, and chlorophyll-a were determined to vary as a function of depth. Tables 14-17 list the mean values of these parameters at varying sampling depths for each of the 11 sampling stations.

7. For consistency, the location of the 11 sampling stations has remained unchanged from the baseline and previous poststocking periods (Figure 1). Based on data collected during the baseline period, it was noted that a trend of varying water quality existed from one lake pool to another at a given time, with the southern and middle pools of Lake Conway exhibiting the best water quality. Biochemical oxygen demand (BOD), chemical oxygen demand (COD), total solids, and nutrient concentrations were found to increase in the eastern and western pools as opposed to the southern and middle pools; an even further increase in these parameters occurred in Lake Gatlin. This

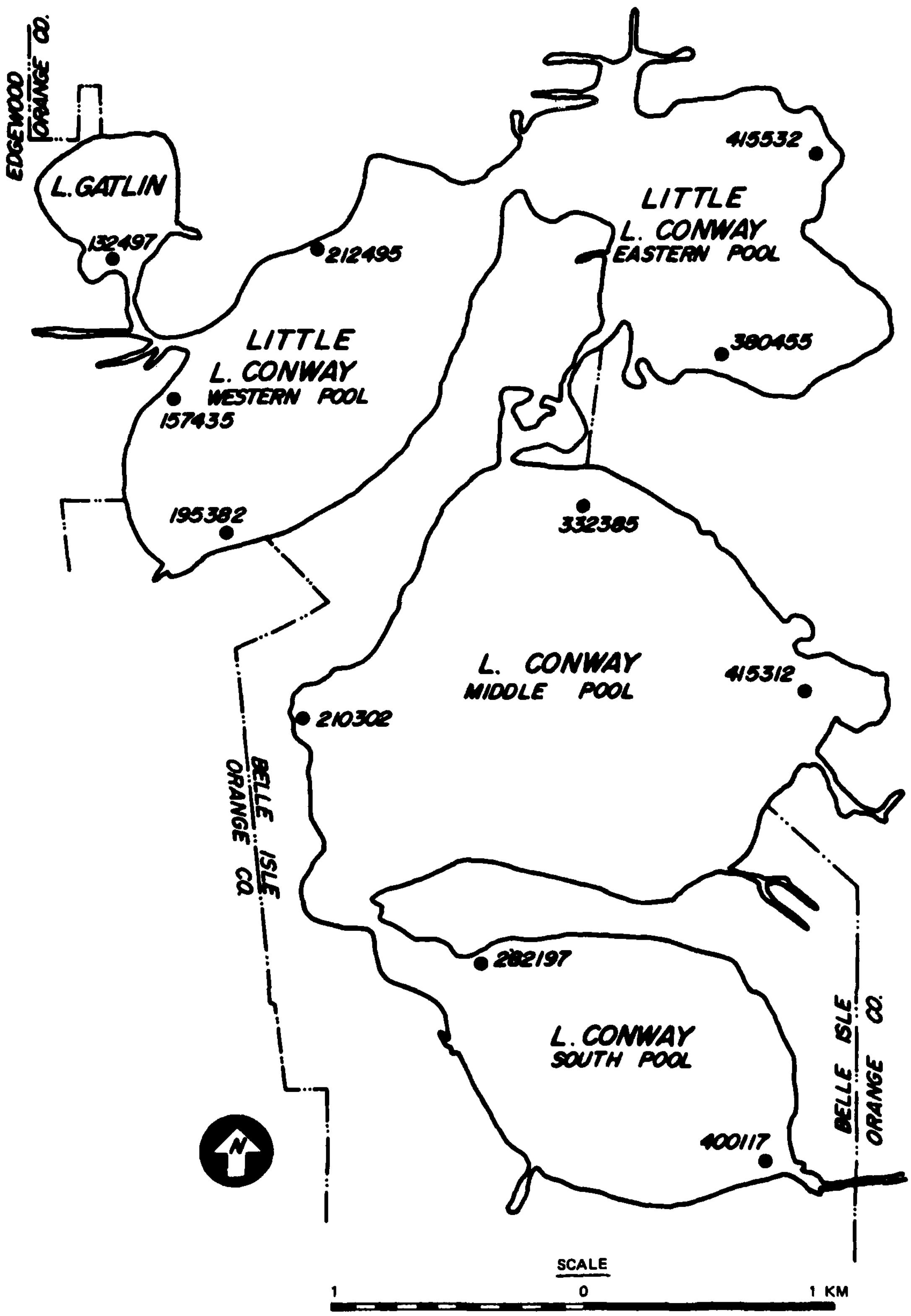

Figure 1. LSOMT sampling station locations

trend changed somewhat during the first poststocking period (September 1977-August 1978) in that all pools with the exception of Lake Gatlin tended toward similar water quality characteristics, while Lake Gatlin continued to exhibit higher concentrations of most parameters (nutrients, minerals, and chlorophyll-a). This same trend also continued during the second poststocking period (September 1978-August 1979). In order to determine if this equalization trend continued through the third poststocking period, Figures 2-7 are provided. These figures graphically present the mean value and standard deviation by sampling station for selected water quality parameters. These parameters include hardness, magnesium, organic nitrogen, BOD, total solids, and chlorophyll-a.

8. During the baseline and first poststocking periods (January 1976-August 1978), ammonia nitrogen was only occasionally measured in amounts above the detection limit of 0.050 mg/ℓ. However, during the second poststocking period, ammonia was consistently measured in concentrations above the detection limit. Therefore, ammonia was added to the aforementioned list of selected water quality parameters. Figure 8 graphically presents the mean value and standard deviation of ammonia concentrations by sampling station.

9. In the baseline report, the determination of relationships between nutrient concentrations and productivity of the various aquatic plant communities in the major pools was emphasized. The first two poststocking reports paid close attention to any changes that may have occurred in these relationships subsequent to introduction of the white amur. This report will also seek to discern any changes in the nutrient-productivity relationship. Monitoring of the phytoplankton community was accomplished through pigment analysis for chlorophyll-a and carotenoids. Figures 9 and 10 graphically present nitrate, organic nitrogen, and chlorophyll-a in a manner that illustrates the monthly variation of these parameters. Figure 9 represents Lake Gatlin while Figure 10 represents the South pool of Lake Conway. All previous reports have concluded that an inverse relationship exists between nitrate and the phytoplankton community (as represented by chlorophyll-a), with an increase in chlorophyll-a concentrations in the summer and fall

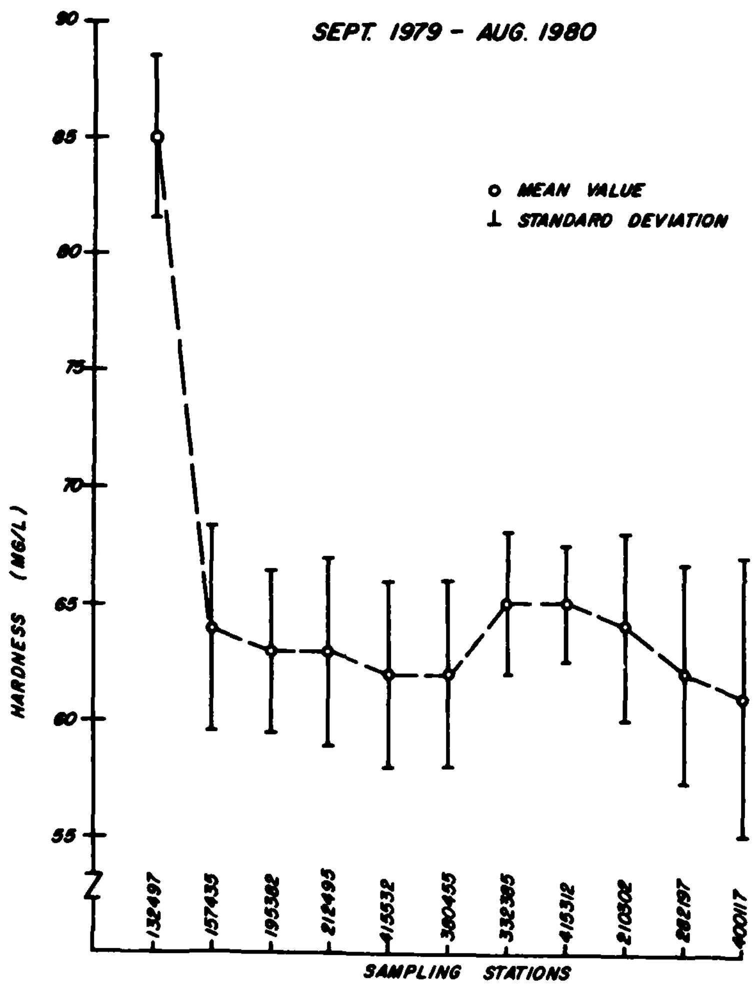

Figure 2. Trends in hardness concentrations

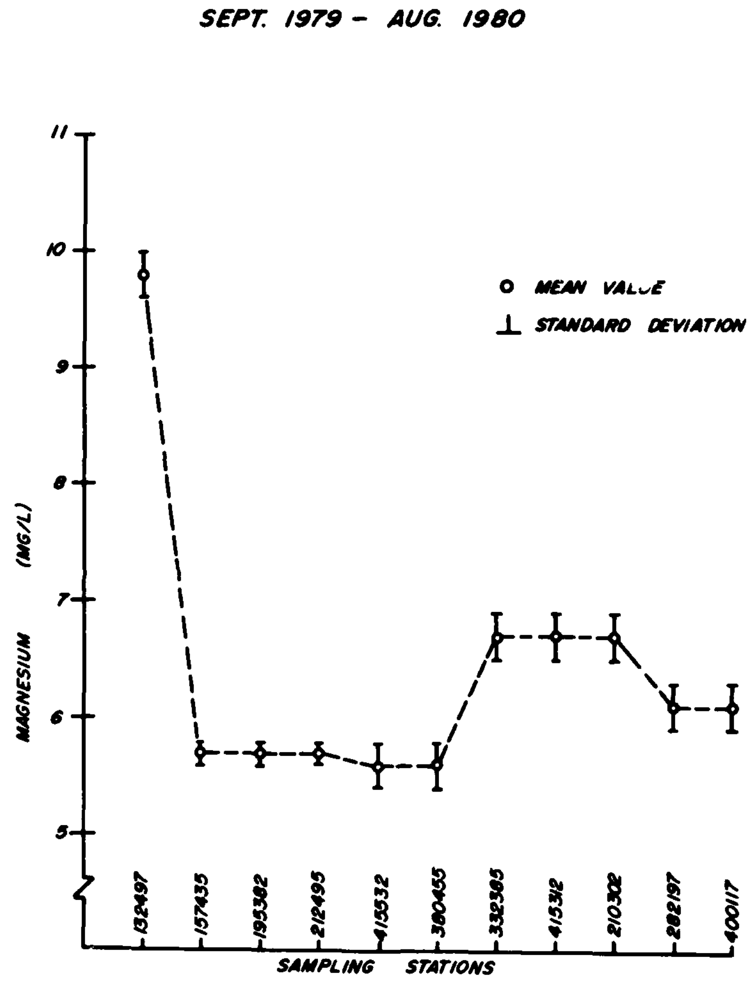

Figure 3. Trends in magnesium concentrations

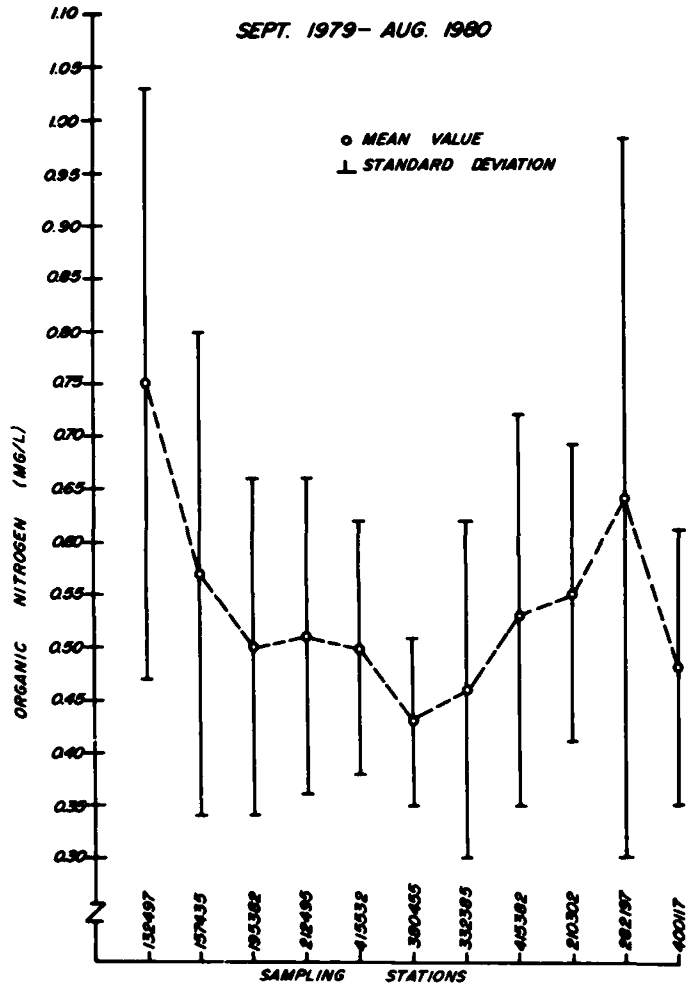

Figure 4. Trends in organic nitrogen concentrations

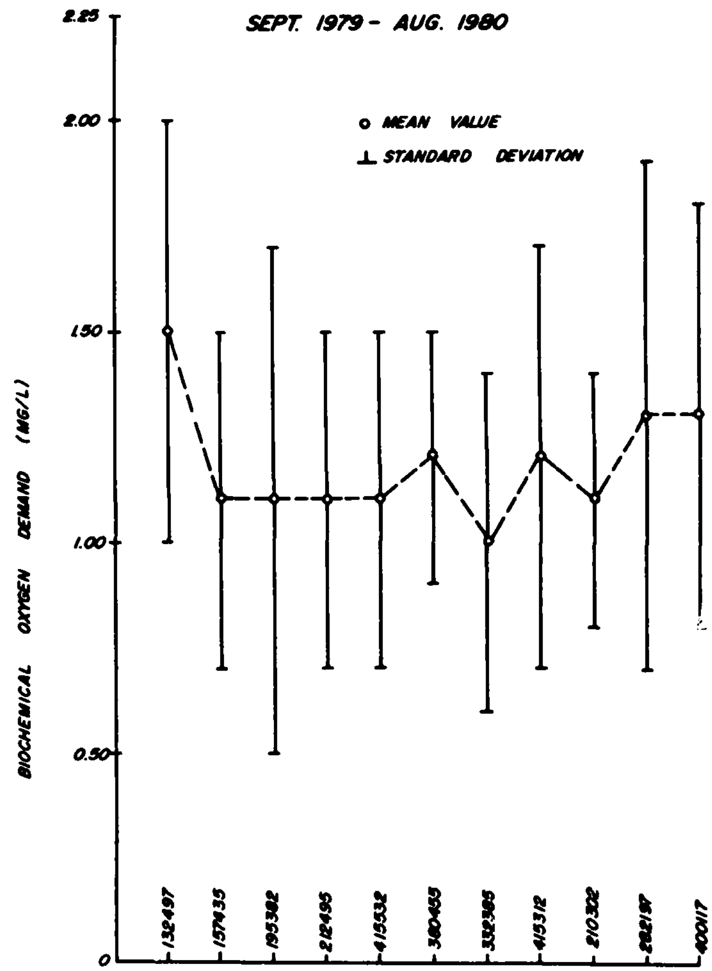

Figure 5. Trends in BOD concentrations

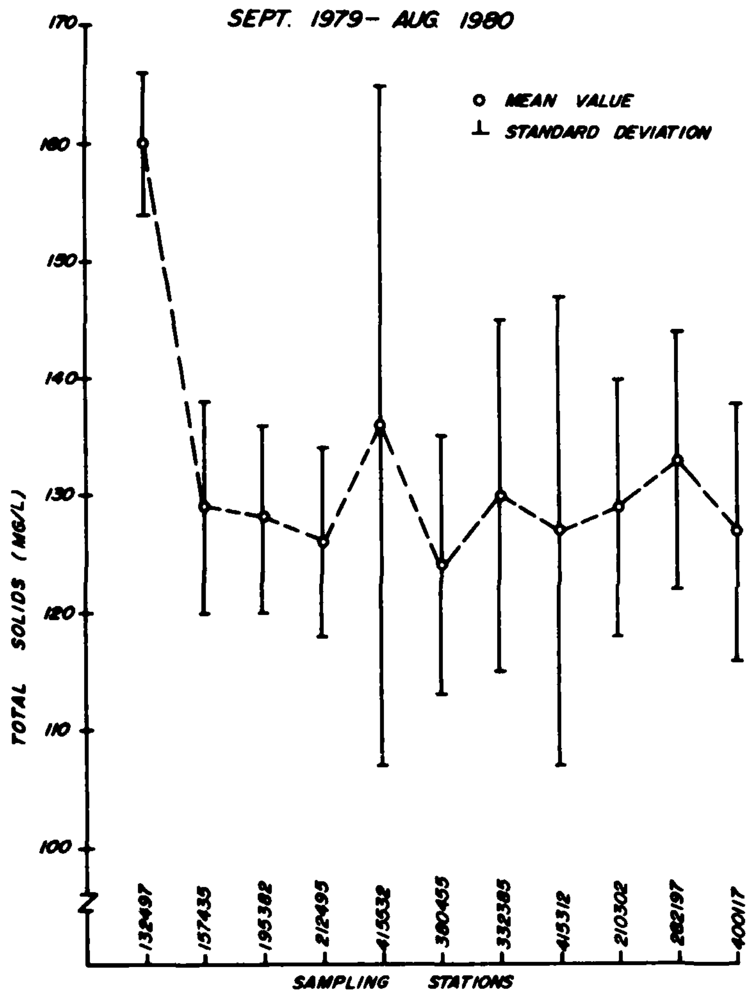

Figure 6. Trends in total solids concentrations

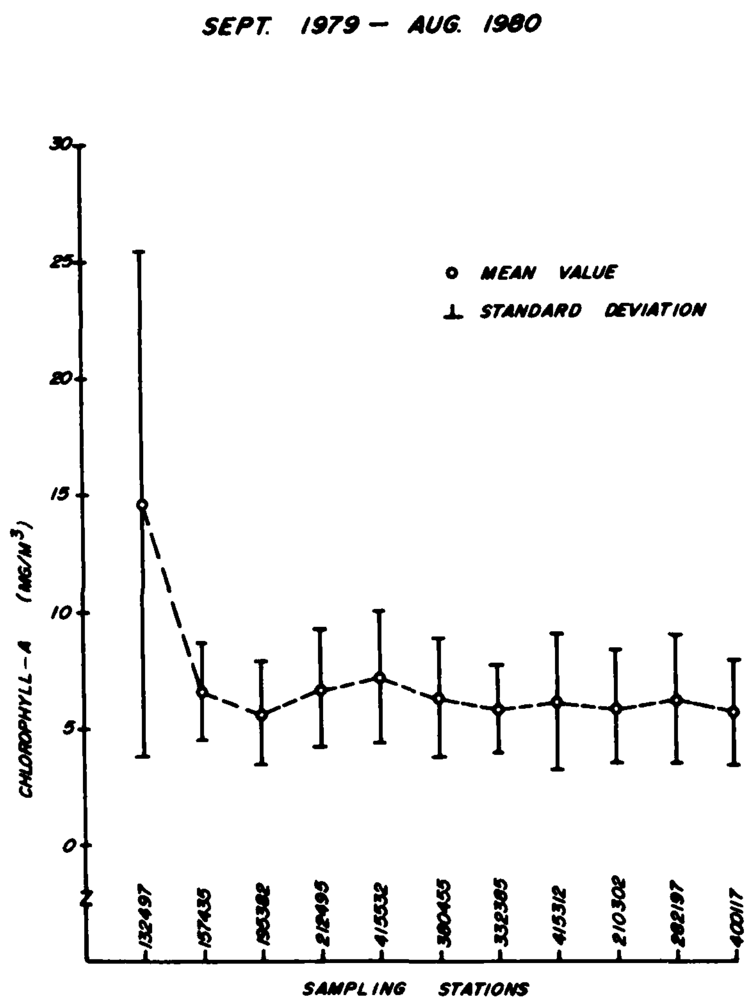

Figure 7. Trends in chlorophyll-a concentrations

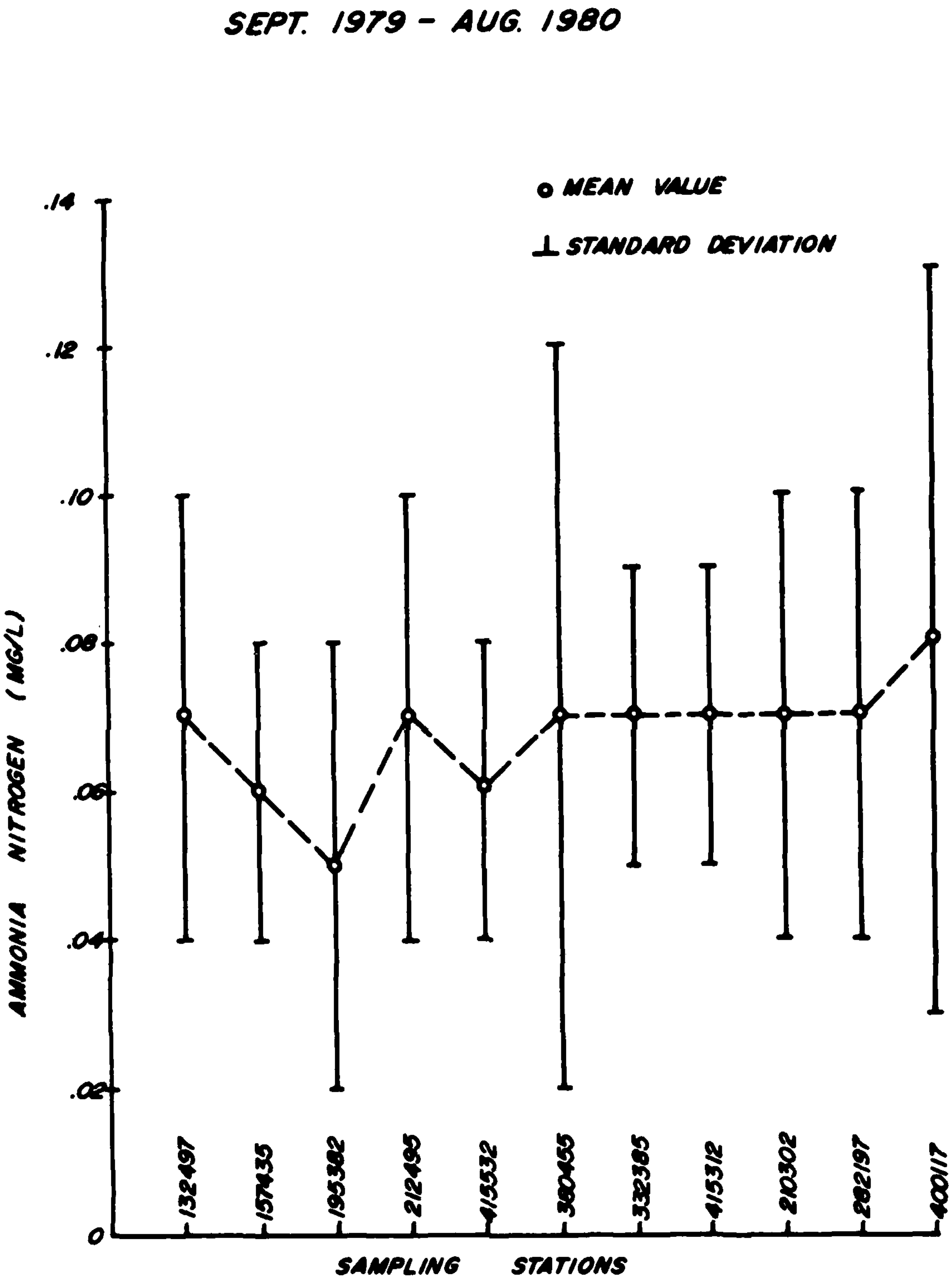

Figure 8. Trends in ammonia nitrogen concentrations

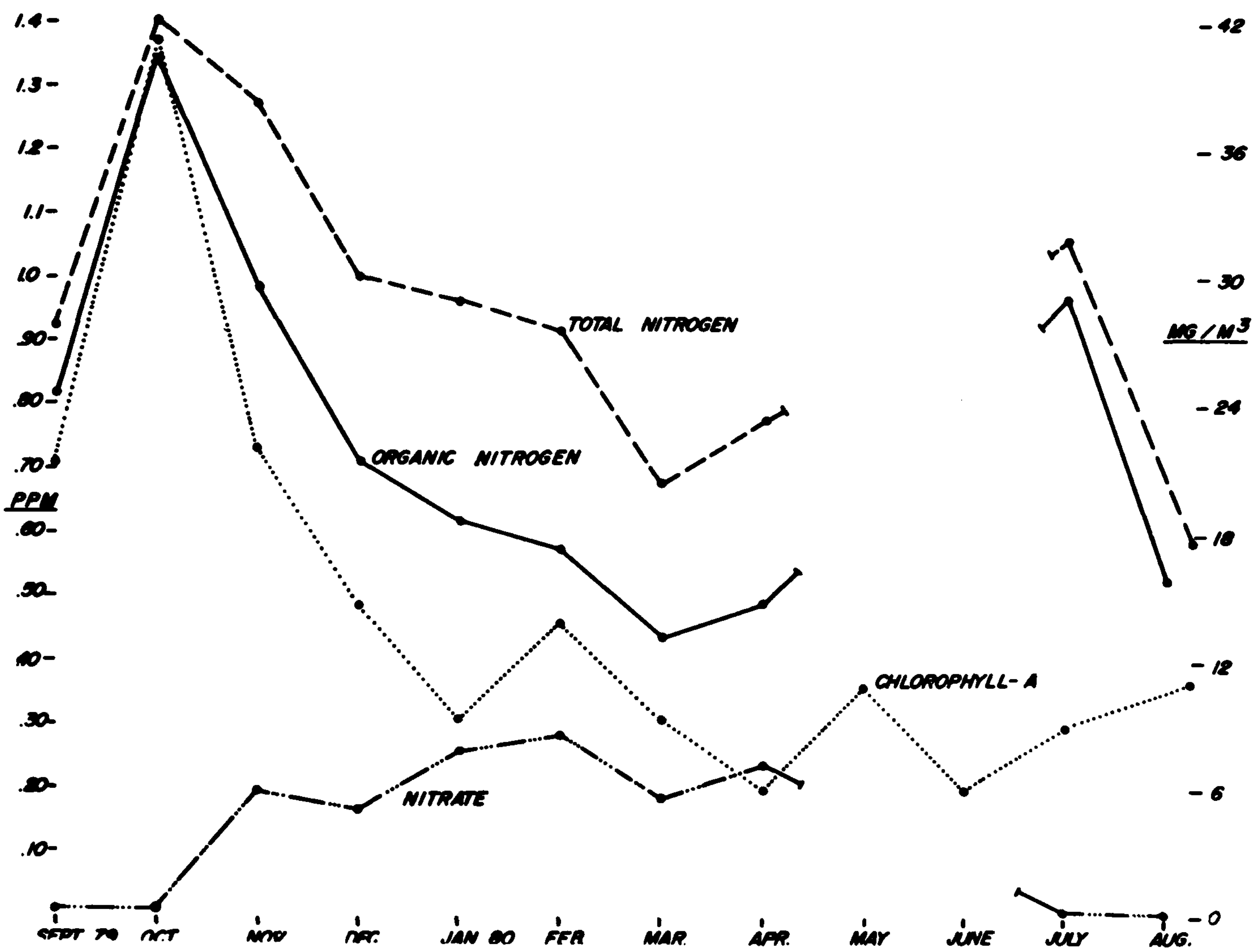

Figure 9. Trends in nitrogen and chlorophyll-a, Lake Gatlin

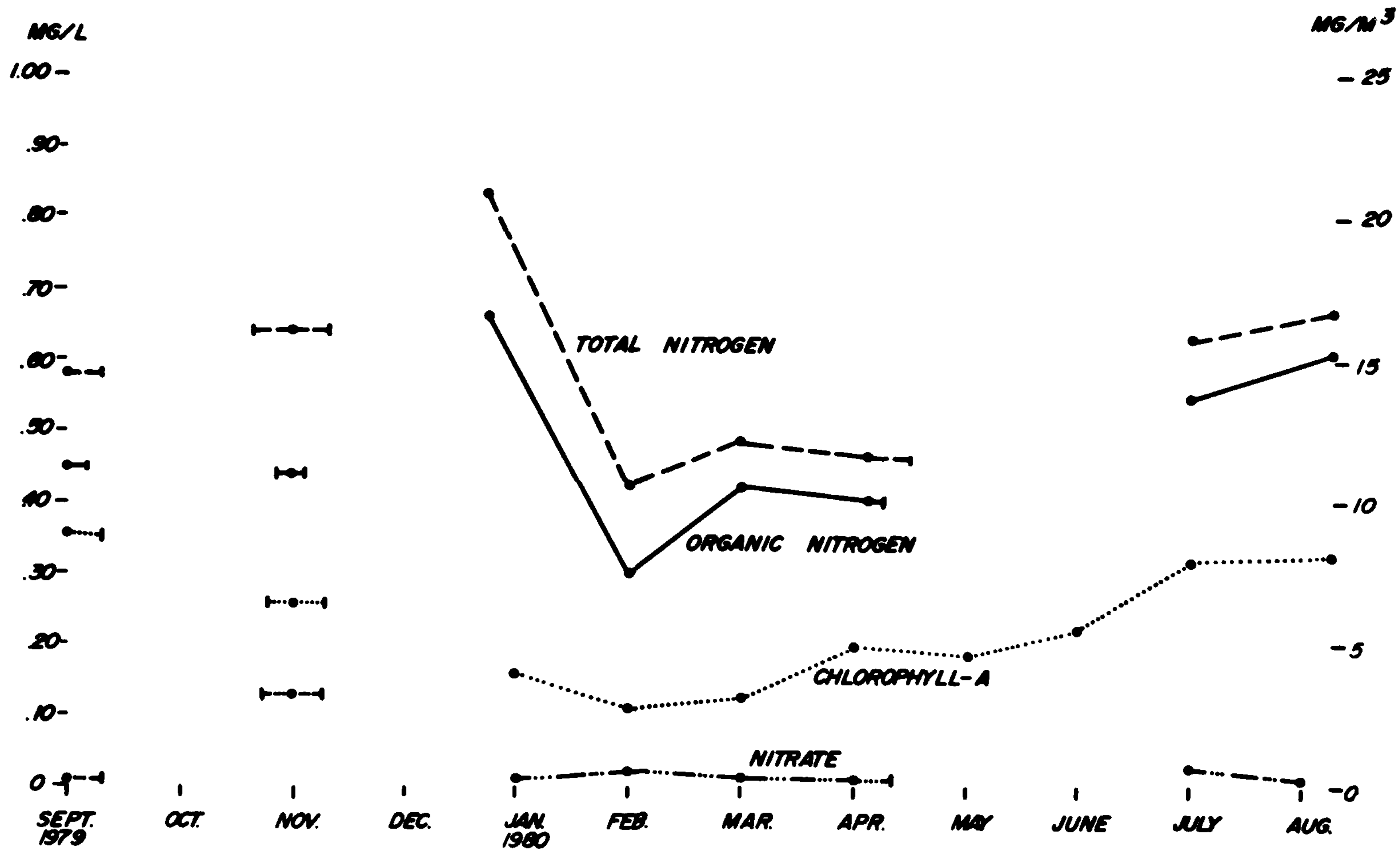

Figure 10. Trends in nitrogen and chlorophyll-a, Lake Conway South pool

coinciding with a decrease in nitrate concentrations. Conversely, during the winter months when phytoplankton activity is at a minimum, nitrate concentrations reach a maximum. Previous reports have also established a direct relationship between chlorophyll-a and organic nitrogen, i.e. as chlorophyll-a increases, there is a corresponding increase in organic nitrogen. These relationships, graphically presented in Figure 9, indicate that fairly high phytoplankton density exists in Lake Gatlin. The South pool of Lake Conway (sta 400117), however, is not dominated by the phytoplankton community, but rather by macrophytes, which also influence the concentration of organic nitrogen and nitrate in the water column. During this sampling period, data were not collected for the months of October, December, May, and June at sta 400117; thus, the relationship between chlorophyll-a, nitrate, and organic nitrogen in Figure 10 is obscured.

10. Figures 11-15 are presented to show seasonal variation for the mean values of temperature, chlorophyll-a, total filterable phosphorus, and organic nitrogen for a selected station in each of the major pools.

11. A major difference exists between the baseline and post-stocking periods in the number of months in which data were collected. For the baseline report, data were collected over a 20-month period (January 1976-August 1977), while the subsequent poststocking reports each covered a 12-month period (September 1977-August 1978 and September 1978-August 1979). The difference in sampling period required an adjustment in mean values and standard deviations for the baseline period in order to account for seasonal bias. Another major difference in data collection concerns missing data for certain months. It was noted in the second poststocking report that data collection during that period differed from the previous poststocking period in that data were not collected for certain months at 6 of the 11 sampling stations.

12. Specifically, beginning in January 1979, sampling events were staggered on a monthly basis in South, Middle, and West pools of Lake Conway. The practice of staggering sampling events in the aforementioned pools continued only during 1979 for the third poststocking period (September 1979-August 1980). No sampling hiatus occurred during

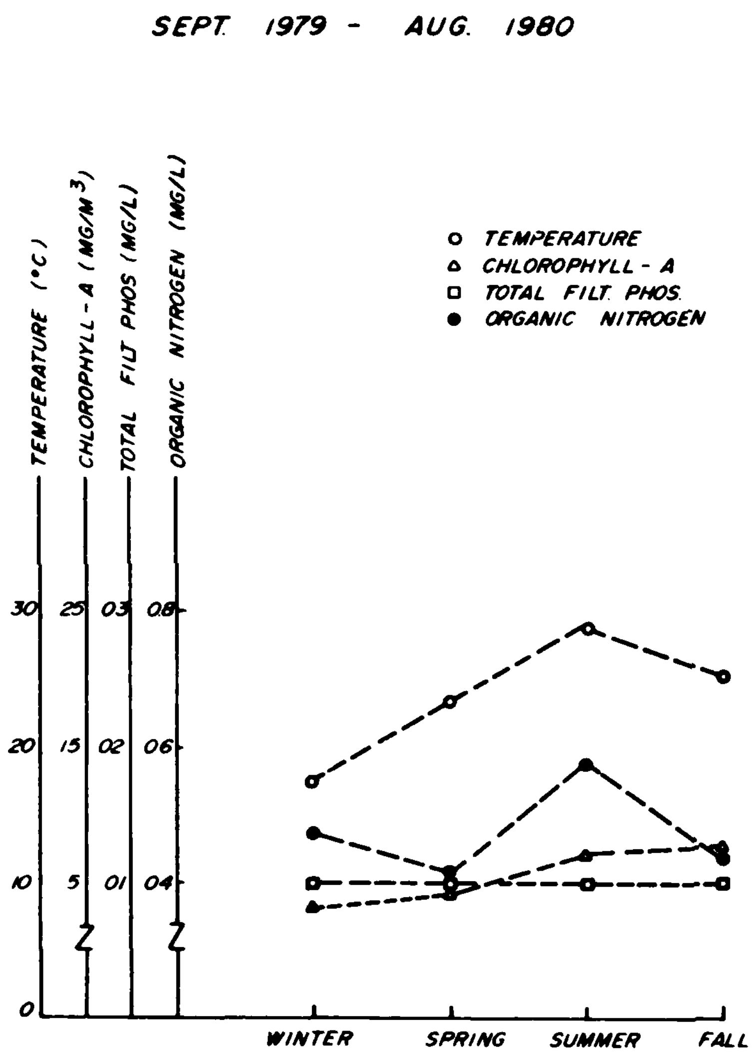

Figure 11. Correlation of selected parameters for sampling sta 400117, Lake Conway South pool

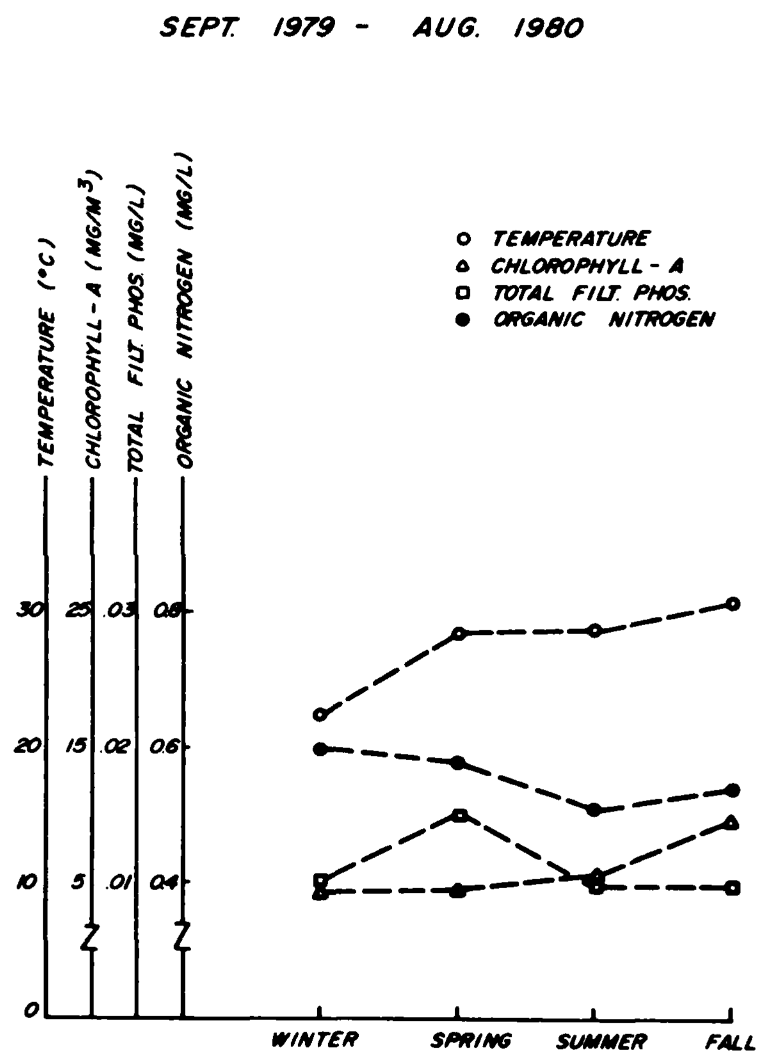

Figure 12. Correlation of selected parameters for sampling sta 210302, Lake Conway Middle pool

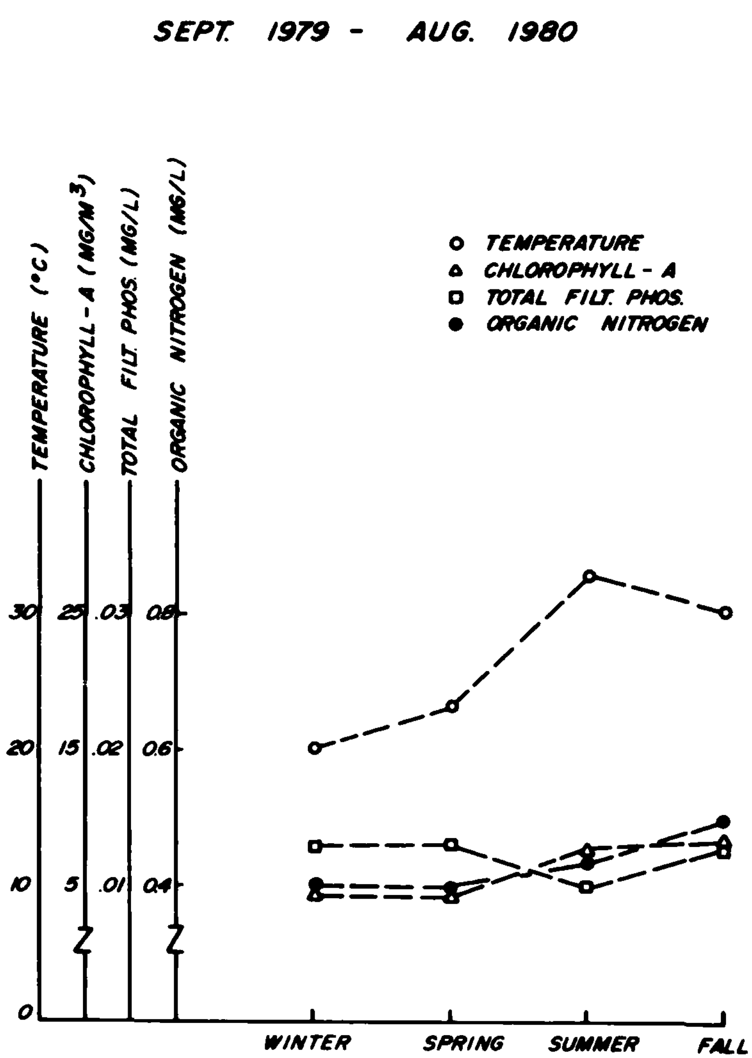

Figure 13. Correlation of selected parameters for sampling sta 380455, Lake Conway East pool

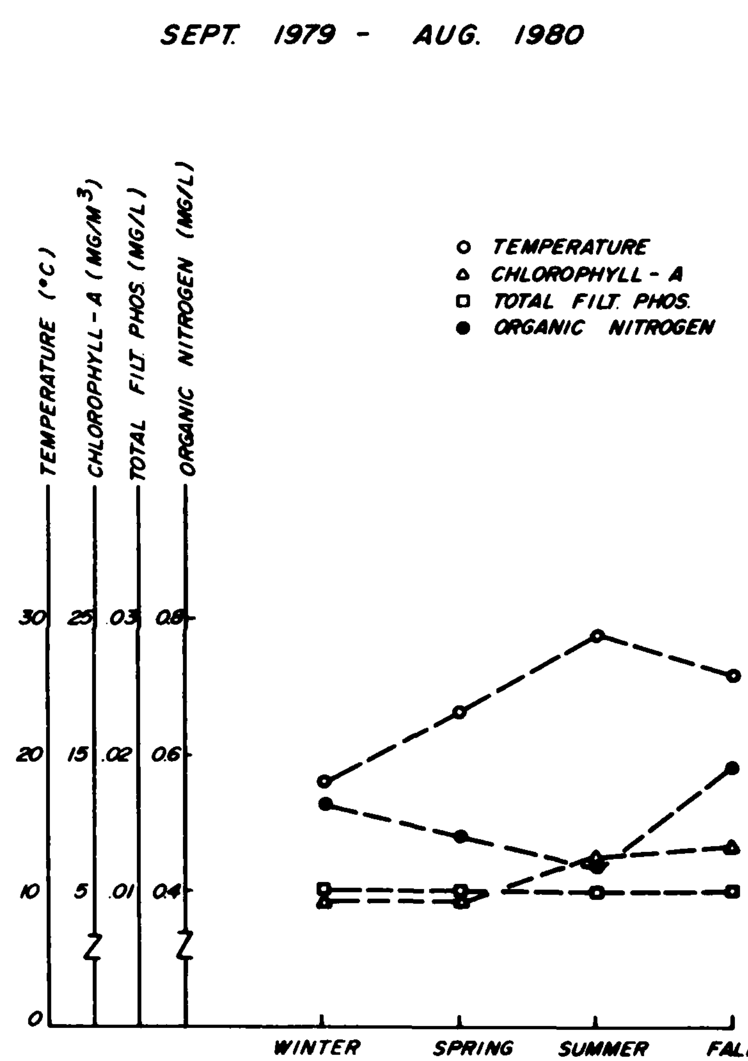

Figure 14. Correlation of selected parameters for sampling sta 195382, Lake Conway West pool

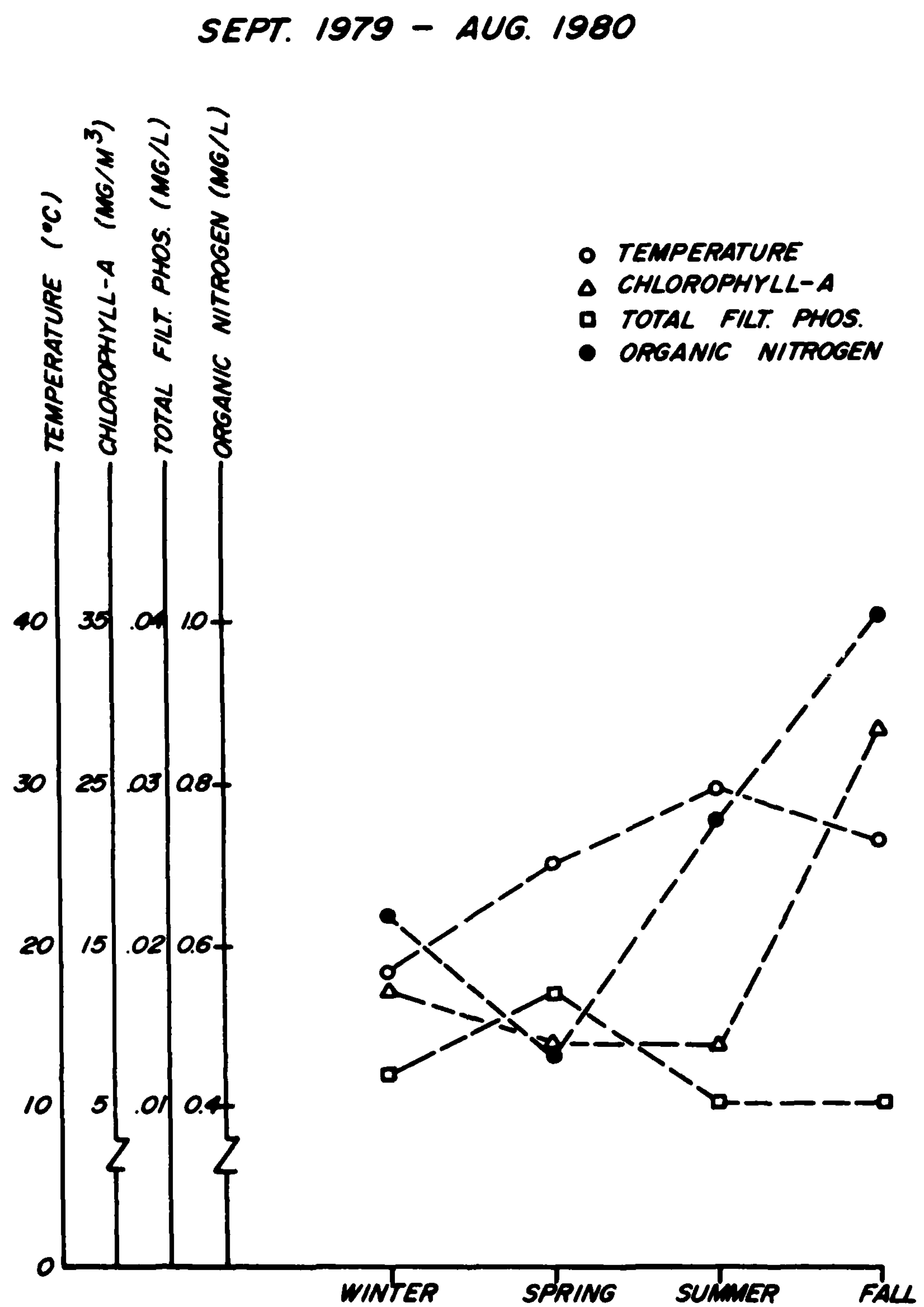

Figure 15. Correlation of selected parameters for sampling sta 132497, Lake Gatlin

1980. The following tabulation indentifies those months in which no data were collected:

Station	Location	1979 Sep	Oct	Nov	Dec
400117	South pool		X[†]		X
282197	South pool			X	
210302	Middle pool		X		X
415312	Middle pool	X		X	
332385	Middle pool				
380455	East pool				
415532	East pool				
212495	West pool		X		X
195382	West pool	X		X	
157435	West pool				
132497	Lake Gatlin				

† Indicates data not collected during this month.

Data analysis

13. In December 1977, the minimum detection limit for nitrate changed from 0.10 mg/ℓ to 0.010 mg/ℓ.* Because readings above the new detection limit are now occurring, due in part to the instrument change, nitrate has been removed from Table 1.

14. The following tabulation presents the range of nitrate concentrations (mg/ℓ) for each of the major pools:

	Baseline	Post-stocking I	Post-stocking II	Post-stocking III
	1/76-8/77	9/77-8/78	9/78-8/79	9/79-8/80
South pool	<0.10-0.12	<0.01-0.06	<0.01-0.03	<0.01-0.16
Middle pool	<0.10-0.10	<0.01-0.09	<0.01-0.02	<0.01-0.19
East pool	<0.10-0.10	<0.01-0.03	<0.01-0.08	<0.01-0.31

* Changed to Technicon Automated Methodology per U. S. Environmental Protection Agency and U. S. Army Corps of Engineers.

	Baseline	Post-stocking I	Post-stocking II	Post-stocking III
West pool	<0.10-0.11	<0.01-0.09	<0.01-0.08	<0.01-0.21
Lake Gatlin	<0.10-0.70	<0.01-0.97	<0.01-0.70	<0.01-0.30

15. For the third poststocking period, maximum nitrate levels occurred during November for South, Middle, and West pools, while the highest nitrate concentration for East pool occurred in April. Lake Gatlin, which had its highest nitrate reading in February, has shown a dramatic decrease in the range of nitrate concentrations; however, all other major pools have shown dramatic increases. Excluding Lake Gatlin, the maximum fluctuation in nitrate concentrations was 0.31 mg/ℓ for the third poststocking period, as opposed to 0.08 mg/ℓ during the second poststocking period. This increase in fluctuation suggests that perhaps a change in nitrate regulation is occurring.

16. In the baseline and first poststocking reports, ammonia nitrogen was included in Table 1 because ammonia concentrations seldom exceeded the 0.05-mg/ℓ minimum detection level. However, during the second poststocking period, ammonia levels began to regularly exceed the detection limit; thus, ammonia nitrogen was deleted from Table 1. Figure 8 shows the mean values and standard deviations for ammonia at all 11 sampling stations.

17. Subsequent to the introduction of the white amur into the Lake Conway system, total filterable phosphorus (TFP) levels decreased. The following tabulation gives a comparison of TFP ranges (mg/ℓ) between the different periods of the study:

	Baseline	Post-stocking I	Post-stocking II	Post-stocking III
	1/76-8/77	9/77-8/78	9/78-8/79	9/79-8/80
South pool	<0.010-0.041	<0.010-0.017	<0.010-0.010	<0.01-0.010
Middle pool	<0.010-0.035	<0.010-0.024	<0.010-0.020	<0.01-0.030
East pool	<0.010-0.041	<0.010-0.021	<0.010-0.020	<0.01-0.020
West pool	<0.010-0.033	<0.010-0.050	<0.010-0.020	<0.01-0.010
Lake Gatlin	<0.010-0.032	<0.010-0.024	<0.010-0.010	<0.01-0.030

18. Concentrations of TFP above 0.01 mg/ℓ were seldom recorded. The mean TFP concentration for Lake Conway has declined throughout the study as shown below:

Period	TFP Concentration, mg/ℓ*
Baseline	0.017
Poststocking I	0.012
Poststocking II	0.010
Poststocking III	0.011

* Based on data collected from all 11 sampling stations.

19. As can be seen from the above tabulation, it appears that TFP concentrations are leveling out following a sharp decrease subsequent to the introduction of the white amur.

20. The comparison of Tables 2-12 to the adjusted baseline data reveals changes in the mean value and standard deviations of several parameters. Phosphorus concentrations have decreased significantly at all 11 sampling stations; however, it appears that a downward trend that occurred during the first poststocking period has begun to level out. The mean concentration of organic nitrogen for the Lake Conway system has increased. However, on an individual basis, six sampling stations have registered increases while five have registered decreases. Mean concentrations of COD have increased at eight sampling stations, decreased at two, and remained the same at one. Mean carotenoid values have increased at eight stations and remained approximately the same at three, to give an overall increase in the mean carotenoid concentration of the Lake Conway system. Mean BOD concentrations have decreased slightly from baseline values, while mean volatile suspended solids concentrations have shown a dramatic increase over the baseline period. Mean chlorophyll-a concentrations continued an upward trend, with 10 of the 11 sampling stations registering increases. Ammonia nitrogen mean concentrations have significantly increased above baseline values, although the mean value for the Lake Conway system has decreased from

the value reported in the second poststocking report. The remaining parameters are present in concentrations similar to those detected during the baseline period.

21. In order to evaluate the nine water quality parameters that have undergone a change from the baseline period, the baseline adjusted mean values for the Lake Conway system are compared below with the corresponding poststocking data:

Parameter	Adjusted Baseline Mean Value*	Poststocking III Mean Value*	Net Change percent
Total filtered phosphorus	0.0165 mg/ℓ	0.011 mg/ℓ	-33
Total unfiltered phosphorus	0.025 mg/ℓ	0.015 mg/ℓ	-40
Organic nitrogen	0.515 mg/ℓ	0.54 mg/ℓ	+5
Carotenoids	3.1 mg/m^3	4.3 mg/m^3	+39
Volatile suspended solids	1.8 mg/ℓ	2.8 mg/ℓ	+56
BOD	1.4 mg/ℓ	1.2 mg/ℓ	-14
COD	15 mg/ℓ	18 mg/ℓ	+20
Cholorophyll-a	5.5 mg/m^3	7.1 mg/m^3	+29
Ammonia nitrogen	0.05 mg/ℓ	0.07 mg/ℓ	+40

* Based on data collected from all 11 sampling stations.

22. As noted in the first poststocking report, the baseline data were adjusted to account for seasonal bias caused by the difference in sampling interval between the baseline and poststocking periods.

23. Three of the nine water quality parameters that exhibited a change from the baseline period have decreased in concentration. These are total filterable phosphorus, total unfilterable phosphorus, and BOD, with only the two phosphorus parameters undergoing a substantial percent decrease when compared to the baseline period. Six constituents: organic nitrogen, carotenoids, volatile suspended solids, COD, chlorophyll-a, and ammonia nitrogen have increased in concentration, with only organic nitrogen not exhibiting a substantial increase when compared with the baseline period.

24. As pointed out in previous reports, changes in water quality data may be caused by factors such as climate, urbanization, and water level changes as well as the introduction of the white amur.

25. Figures 2-7 presented in the baseline report illustrated apparent trends in selected water quality parameters among the major lake pools. This was accomplished by plotting the mean concentration and standard deviation of the selected parameter for each of the 11 sampling stations. For comparison purposes, the same figures are also presented for this poststocking report, with the additional inclusion of Figure 8, which illustrates ammonia nitrogen.

26. Figure 2, which depicts hardness concentrations throughout the major pools, differs from the baseline period in that mean hardness concentrations in the South and Middle pools are increasing relative to East and West pools, which have undergone a decline in mean hardness values. Lake Gatlin still exhibits the highest hardness concentration among the major pools, as was noted in previous poststocking reports.

27. Figure 3, which shows mean magnesium concentrations, has changed little when compared to the baseline period. The magnesium trend is almost identical, although it appears that it has shifted slightly downward.

28. Organic nitrogen mean concentrations (Figure 4) have generally increased in the South and Middle pools, decreased in the East pool, remained the same in the West pool, and substantially increased in Lake Gatlin. The standard deviation at all of the sampling stations for this parameter has increased. Lake Gatlin continues to register the highest organic nitrogen mean concentration.

29. Mean BOD concentrations (Figure 5) have decreased slightly in all major pools with the exception of Lake Gatlin and the South pool. Lake Gatlin, as reported in the previous poststocking reports, has the highest mean BOD concentration.

30. Figure 6 shows that the trend of mean total solids concentrations has changed from the baseline period; the trend has become less consistent. However, Lake Gatlin continues to register the highest value for mean total solids of all the lakes.

31. Figure 7, which illustrates mean chlorophyll-a concentrations, has changed little from the baseline period, although the trend line has shifted upwards, thus indicating a slight increase in chlorophyll-a concentrations throughout the Lake Conway System.

32. Mean ammonia nitrogen concentrations are shown in Figure 8, and since this figure was not included in the baseline report, no comparison to the baseline period can be made. However, in comparison with the second poststocking period, mean ammonia nitrogen concentrations have decreased.

33. The month-by-month variation of nitrate nitrogen, organic nitrogen, and chlorophyll-a for Lake Gatlin is presented in Figure 9. Although data for the months of May and June are missing, a few changes from the baseline period are notable. Specifically, a major change in the relative concentrations of nitrate and chlorophyll-a occurred during the winter of 1979-1980. Normally, during the winter months when phytoplankton activity is at a minimum, nitrate levels rise to their yearly maximum while chlorophyll-a concentrations decrease. This inverse relationship is also in effect during the summer and fall months when heightened phytoplankton activity utilizes the available nitrate; thus, nitrate concentrations are at a minimum while chlorophyll-a concentrations are at a maximum. Although nitrate concentrations for the third poststocking period were at a maximum during the winter as would be expected, the peak nitrate concentrations were substantially lower during this period than in the baseline or the two previous poststocking periods. Also, chlorophyll-a concentrations were higher than usual during the winter. As in the baseline period, peak mean organic nitrogen concentrations occurred during the fall.

34. Figure 10 presents data for the South pool of Lake Conway similar in format to Figure 9. Unfortunately, 4 months of data are missing; thus, the relationship between the parameters is obscured. From the data that are available, nitrate levels generally remained extremely low, an observation which held during the baseline period. Chlorophyll-a levels remained essentially the same, with peak mean concentrations occurring during the summer and fall. The missing data

prevent any meaningful observation of organic nitrogen levels.

35. Figures 11-15 present seasonal trends for four water quality parameters including temperature, chlorophyll-a, total filterable phosphorus, and organic nitrogen. Each of the figures is based on a representative station from each of the five major pools. Temperature trends were similar to those reported in previous reports, while trends in chlorophyll-a remained generally the same although there appeared to be a slight increase in mean concentrations. The trend of total filterable phosphorus has undergone a dramatic change, with values usually close to the minimum detection level, as opposed to the baseline period when a much more seasonal fluctuation was evident. Organic nitrogen exhibited a dissimilar trend when compared with the baseline period, and demonstrated greater seasonal fluctuations.

36. Figure 16 has been provided to illustrate the important

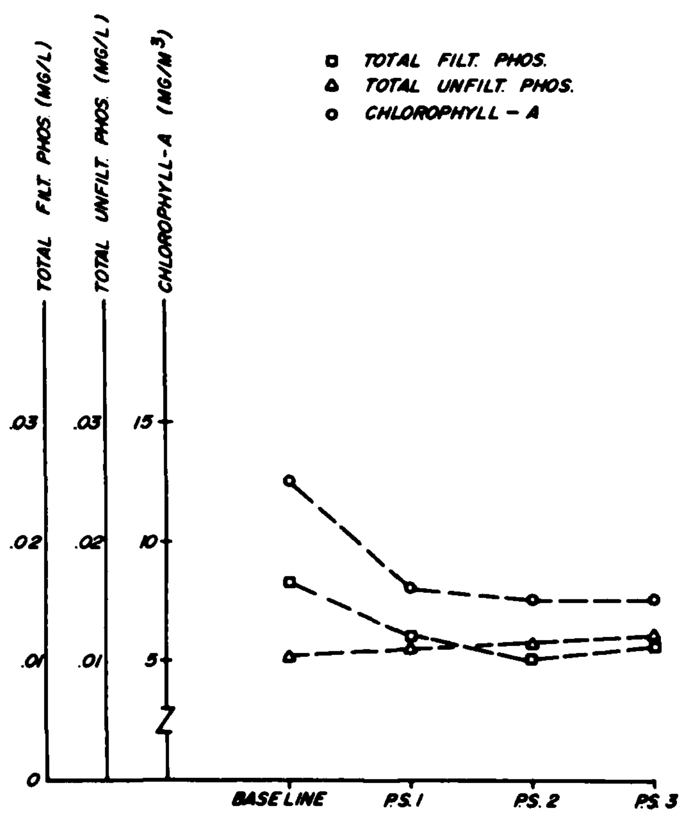

Figure 16. Trends of selected parameters for Lake Conway

trends that have developed during the three poststocking periods for the water quality parameters chlorophyll-a, total filterable phosphorus, and total unfilterable phosphorus. Mean concentrations are based on data collected from all 11 sampling stations. Both phosphorus parameters have undergone substantial decreases in mean concentration subsequent to the introduction of the white amur. This downward trend has leveled out during the second and third poststocking periods for both forms of phosphorus. As opposed to phosphorus, chlorophyll-a exhibited a gradual but steady upward trend.

Sediment Quality

Data compilation

37. During this poststocking period, sediment data were collected on four occasions at each of the 11 sampling stations. Table 18 contains all of the collected data, while Table 19 presents the mean value and standard deviation of each measured parameter.

Data analysis

38. The baseline report noted that nitrogen and phosphorus concentrations varied randomly from station to station. This random variation continued throughout the first and second poststocking periods, and appears to have continued during this period. The mean concentration for nitrogen has fluctuated between 2.6 and 3.3 mg/g, while standard deviation increased from 2.69 during the baseline to 5.1 during this period. The mean total phosphorus value of 0.21 mg/g is a decrease from 0.44 mg/g as reported for the baseline period. Table 19 demonstrates that mean total phosphorus concentrations in the sediment have steadily decreased subsequent to the introduction of the white amur.

39. Mean copper concentrations have increased throughout the three poststocking periods to a high of 48 μg/g during this period. The large standard deviations associated with copper indicate the wide range of values recorded for each station. Mean lead concentrations have shown a general increasing trend throughout the poststocking periods, with the mean value of this parameter increasing to 21 μg/g

as compared to 9.08 μg/g detected in the baseline period. Mean concentrations of COD have not changed dramatically, while mean iron values have continued to fluctuate. Manganese, while not recorded during the baseline period, has undergone no definite trend during the three post-stocking periods.

Aquatic Plant Data Presentation

40. Table 20 presents the raw data recorded during this 12-month period for nutrient, organic, and other chemical contents of the aquatic plants identified in the Lake Conway System.

PART III: CONCLUSIONS

41. As discussed in the second poststocking report, a few water quality parameters that had previously been present in undetectable amounts entered the detectable range during the second poststocking period. Nitrate nitrogen was observed in measurable concentrations as the result of a decrease in the detection level for this parameter. Ammonia nitrogen which, prior to the second poststocking period, was only occasionally measured in amounts above the detectable level was frequently measured at concentrations exceeding the detection limit during the third poststocking period. Conversely, during this period both total filterable phosphorus and total unfilterable phosphorus were consistently observed to be present in amounts below the detection level. Other water quality parameters normally found to be present in the undetectable range experienced only minor changes in the frequency in which detectable values occurred.

42. Several changes were noted when comparing the mean values of the third poststocking period to the baseline period for each of the 11 sampling stations. Both total filterable and total unfilterable phosphorus mean concentrations decreased at all 11 sampling stations. Mean BOD concentrations decreased slightly in all major pools with the exception of Lake Gatlin and the South pool. Ammonia nitrogen values increased in relation to the second poststocking period. Volatile suspended solids, carotenoids, and COD mean concentrations generally exhibited increases throughout the lake system. Chlorophyll-a mean concentrations continued a gradual upward trend during this period.

43. The baseline report established that a trend of decreasing water quality existed when proceeding from the South pool of Lake Conway to Lake Gatlin. The first and second poststocking reports noted that this trend appeared to change in that the South, Middle, East, and West pools showed a tendency toward similar water quality conditions. This equalization of water quality appeared to continue during the third poststocking period. However, as in the baseline period, Lake Gatlin

continued to exhibit the poorest water quality conditions of the Lake Conway System.

44. Subsequent to the introduction of the white amur, both phosphorus parameters underwent dramatic downward trends that presently appear to be stabilizing. The gradual upward trend of chlorophyll-a continued during the third 12-month poststocking period; thus, it is possible that a significant change in the mean chlorophyll-a concentration will occur in the future. It is recommended that such key parameters as chlorophyll-a, phosphorus, organic nitrogen, carotenoids, and ammonia nitrogen continue to be monitored so that any significant future water quality changes can be discerned.

45. Sediment quality data showed several changes from the baseline period. Total phosphorus mean concentrations underwent a steady decrease throughout the poststocking periods, while, conversely, mean copper and lead concentrations generally increased. Total nitrogen, COD, iron, and manganese mean concentrations exhibited no definite trends throughout the three poststocking periods.

Table 1

Detection Level of Parameters Present in Amounts Too Small to Register on the Measuring Device

Parameter	Detectable Level, mg/ℓ
Orthophosphorus (P)	0.010
Copper* (Cu)	0.010
Iron** (Fe)	0.050
Lead** (Pb)	0.010

* Occasionally measured in amounts exceeding detectable level.

** Rarely measured in amounts exceeding detectable level.

Table 2

Poststocking Data Compilation

Sampling Sta 400117

Parameter	Mean Value	Standard Deviation
Temperature	24.2°C	4.4°C
Conductivity	221 μmho/cm	6 μmho/cm
Alkalinity	28 mg/ℓ	1.9 mg/ℓ
Hardness	61 mg/ℓ	6.0 mg/ℓ
Calcium	15 mg/ℓ	2.3 mg/ℓ
Sodium	18 mg/ℓ	1.0 mg/ℓ
Potassium	4.9 mg/ℓ	0.3 mg/ℓ
Magnesium	6.1 mg/ℓ	0.2 mg/ℓ
Secchi disk	2.6 m	0.6 m
Organic nitrogen	0.48 mg/ℓ	0.13 mg/ℓ
BOD	1.3 mg/ℓ	0.5 mg/ℓ
COD	19 mg/ℓ	22 mg/ℓ
Total solids	127 mg/ℓ	11 mg/ℓ
Total phosphorus (filtered)	Below detection limit	--
Total phosphorus (unfiltered)	0.015 mg/ℓ	0.009 mg/ℓ
Volatile suspended solids	3.2 mg/ℓ	3.2 mg/ℓ
Carotenoids	3.4 mg/m^3	1.9 mg/m^3
Ammonia nitrogen	0.08 mg/ℓ	0.05 mg/ℓ

Table 3

Poststocking Data Compilation

Sampling Sta 282197

Parameter	Mean Value	Standard Deviation
Temperature	24.0°C	4.8°C
Conductivity	220 μmho/cm	3 μmho/cm
Alkalinity	28 mg/ℓ	2.0 mg/ℓ
Hardness	62 mg/ℓ	4.7 mg/ℓ
Calcium	15 mg/ℓ	1.8 mg/ℓ
Sodium	17 mg/ℓ	0.9 mg/ℓ
Potassium	4.8 mg/ℓ	0.2 mg/ℓ
Magnesium	6.1 mg/ℓ	0.2 mg/ℓ
Secchi disk	2.7 m	0.6 m
Organic nitrogen	0.64 mg/ℓ	0.34 mg/ℓ
BOD	1.3 mg/ℓ	0.6 mg/ℓ
COD	13 mg/ℓ	4 mg/ℓ
Total solids	133 mg/ℓ	11 mg/ℓ
Total phosphorus (filtered)	Below detection limit	--
Total phosphorus (unfiltered)	0.014 mg/ℓ	0.005 mg/ℓ
Volatile suspended solids	2.7 mg/ℓ	3.0 mg/ℓ
Carotenoids	3.9 mg/m^3	1.7 mg/m^3
Ammonia nitrogen	0.07 mg/ℓ	0.03 mg/ℓ

Table 4

Poststocking Data Compilation

Sampling Sta 210302

Parameter	Mean Value	Standard Deviation
Temperature	24.3°C	4.4°C
Conductivity	223 μmho/cm	6 μmho/cm
Alkalinity	32 mg/ℓ	0.6 mg/ℓ
Hardness	64 mg/ℓ	4.1 mg/ℓ
Calcium	15 mg/ℓ	1.4 mg/ℓ
Sodium	17 mg/ℓ	1.0 mg/ℓ
Potassium	4.5 mg/ℓ	0.2 mg/ℓ
Magnesium	6.7 mg/ℓ	0.2 mg/ℓ
Secchi disk	2.7 m	0.3 m
Organic nitrogen	0.55 mg/ℓ	0.14 mg/ℓ
BOD	1.1 mg/ℓ	0.3 mg/ℓ
COD	14 mg/ℓ	7 mg/ℓ
Total solids	129 mg/ℓ	11 mg/ℓ
Total phosphorus (filtered)	0.012 mg/ℓ	0.005 mg/ℓ
Total phosphorus (unfiltered)	0.013 mg/ℓ	0.004 mg/ℓ
Volatile suspended solids	2.6 mg/ℓ	2.2 mg/ℓ
Carotenoids	4.4 mg/m^3	1.4 mg/m^3
Ammonia nitrogen	0.07 mg/ℓ	0.03 mg/ℓ

Table 5

Poststocking Data Compilation

Sampling Sta 415312

Parameter	Mean Value	Standard Deviation
Temperature	23.2°C	4.7°C
Conductivity	224 μmho/cm	6 μmho/cm
Alkalinity	32 mg/ℓ	1.3 mg/ℓ
Hardness	65 mg/ℓ	2.5 mg/ℓ
Calcium	15 mg/ℓ	1.0 mg/ℓ
Sodium	17 mg/ℓ	1.0 mg/ℓ
Potassium	4.5 mg/ℓ	0.2 mg/ℓ
Magnesium	6.7 mg/ℓ	0.2 mg/ℓ
Secchi disk	2.8 m	0.5 m
Organic nitrogen	0.53 mg/ℓ	0.19 mg/ℓ
BOD	1.2 mg/ℓ	0.5 mg/ℓ
COD	14 mg/ℓ	6 mg/ℓ
Total solids	127 mg/ℓ	20 mg/ℓ
Total phosphorus (filtered)	0.011 mg/ℓ	0.002 mg/ℓ
Total phosphorus (unfiltered)	0.014 mg/ℓ	0.009 mg/ℓ
Volatile suspended solids	3.7 mg/ℓ	4.0 mg/ℓ
Carotenoids	4.0 mg/m^3	1.3 mg/m^3
Ammonia nitrogen	0.07 mg/ℓ	0.02 mg/ℓ

Table 6

Poststocking Data Compilation

Sampling Sta 332385

Parameter	Mean Value	Standard Deviation
Temperature	24.0°C	4.6°C
Conductivity	223 μmho/cm	6 μmho/cm
Alkalinity	32 mg/ℓ	0.9 mg/ℓ
Hardness	65 mg/ℓ	3.1 mg/ℓ
Calcium	15 mg/ℓ	1.2 mg/ℓ
Sodium	17 mg/ℓ	0.9 mg/ℓ
Potassium	4.5 mg/ℓ	0.2 mg/ℓ
Magnesium	6.7 mg/ℓ	0.2 mg/ℓ
Secchi disk	2.0 m	0.3 m
Organic nitrogen	0.46 mg/ℓ	0.16 mg/ℓ
BOD	1.0 mg/ℓ	0.4 mg/ℓ
COD	18 mg/ℓ	8 mg/ℓ
Total solids	130 mg/ℓ	15 mg/ℓ
Total phosphorus (filtered)	Below detection limit	--
Total phosphorus (unfiltered)	0.013 mg/ℓ	0.005 mg/ℓ
Volatile suspended solids	2.3 mg/ℓ	3.0 mg/ℓ
Carotenoids	3.9 mg/m^3	1.1 mg/ℓ^3
Ammonia nitrogen	0.07 mg/ℓ	0.02 mg/ℓ

Table 7

Poststocking Data Compilation

Sampling Sta 380455

Parameter	Mean Value	Standard Deviation
Temperature	23.8°C	4.0°C
Conductivity	214 μmho/cm	4 μmho/cm
Alkalinity	31 mg/ℓ	2.3 mg/ℓ
Hardness	62 mg/ℓ	4.1 mg/ℓ
Calcium	16 mg/ℓ	1.6 mg/ℓ
Sodium	16 mg/ℓ	0.9 mg/ℓ
Potassium	4.6 mg/ℓ	0.2 mg/ℓ
Magnesium	5.6 mg/ℓ	0.2 mg/ℓ
Secchi disk	1.4 m	0.2 m
Organic nitrogen	0.43 mg/ℓ	0.08 mg/ℓ
BOD	1.2 mg/ℓ	0.3 mg/ℓ
COD	20 mg/ℓ	7 mg/ℓ
Total solids	124 mg/ℓ	11 mg/ℓ
Total phosphorus (filtered)	0.013 mg/ℓ	0.005 mg/ℓ
Total phosphorus (unfiltered)	0.016 mg/ℓ	0.005 mg/ℓ
Volatile suspended solids	2.6 mg/ℓ	2.9 mg/ℓ
Carotenoids	3.5 mg/m^3	1.2 mg/m^3
Ammonia nitrogen	0.07 mg/ℓ	0.05 mg/ℓ

Table 8

Poststocking Data Compilation

Sampling Sta 415532

Parameter	Mean Value	Standard Deviation
Temperature	24.0°C	4.5°C
Conductivity	215 μmho/cm	5 μmho/cm
Alkalinity	31 mg/ℓ	2.0 mg/ℓ
Hardness	62 mg/ℓ	4.0 mg/ℓ
Calcium	16 mg/ℓ	1.6 mg/ℓ
Sodium	16 mg/ℓ	1.1 mg/ℓ
Potassium	4.7 mg/ℓ	0.2 mg/ℓ
Magnesium	5.6 mg/ℓ	0.2 mg/ℓ
Secchi disk	2.5 m	0.5 m
Organic nitrogen	0.50 mg/ℓ	0.12 mg/ℓ
BOD	1.1 mg/ℓ	0.4 mg/ℓ
COD	22 mg/ℓ	17 mg/ℓ
Total solids	136 mg/ℓ	29 mg/ℓ
Total phosphorus (filtered)	0.011 mg/ℓ	0.003 mg/ℓ
Total phosphorus (unfiltered)	0.016 mg/ℓ	0.005 mg/ℓ
Volatile suspended solids	2.3 mg/ℓ	2.3 mg/ℓ
Carotenoids	4.1 mg/m^3	1.4 mg/m^3
Ammonia nitrogen	0.06 mg/ℓ	0.02 mg/ℓ

Table 9

Poststocking Data Compilation

Sampling Sta 212495

Parameter	Mean Value	Standard Deviation
Temperature	24.6°C	4.4°C
Conductivity	219 μmho/cm	4 μmho/cm
Alkalinity	31 mg/ℓ	2.3 mg/ℓ
Hardness	63 mg/ℓ	4.1 mg/ℓ
Calcium	16 mg/ℓ	1.6 mg/ℓ
Sodium	17 mg/ℓ	0.9 mg/ℓ
Potassium	4.7 mg/ℓ	0.2 mg/ℓ
Magnesium	5.7 mg/ℓ	0.1 mg/ℓ
Secchi disk	2.6 m	0.6 m
Organic nitrogen	0.51 mg/ℓ	0.15 mg/ℓ
BOD	1.1 mg/ℓ	0.4 mg/ℓ
COD	20 mg/ℓ	7 mg/ℓ
Total solids	126 mg/ℓ	8 mg/ℓ
Total phosphorus (filtered)	Below detection limit	--
Total phosphorus (unfiltered)	0.013 mg/ℓ	0.005 mg/ℓ
Volatile suspended solids	2.0 mg/ℓ	2.0 mg/ℓ
Carotenoids	3.9 mg/m^3	1.5 mg/m^3
Ammonia nitrogen	0.07 mg/ℓ	0.03 mg/ℓ

Table 10

Poststocking Data Compilation

Sampling Sta 195382

Parameter	Mean Value	Standard Deviation
Temperature	23.7°C	4.6°C
Conductivity	217 μmho/cm	5 μmho/cm
Alkalinity	32 mg/ℓ	1.8 mg/ℓ
Hardness	63 mg/ℓ	3.5 mg/ℓ
Calcium	16 mg/ℓ	1.4 mg/ℓ
Sodium	17 mg/ℓ	0.9 mg/ℓ
Potassium	4.6 mg/ℓ	0.2 mg/ℓ
Magnesium	5.7 mg/ℓ	0.1 mg/ℓ
Secchi disk	2.4 m	0.4 m
Organic nitrogen	0.50 mg/ℓ	0.15 mg/ℓ
BOD	1.1 mg/ℓ	0.6 mg/ℓ
COD	21 mg/ℓ	7 mg/ℓ
Total solids	128 mg/ℓ	8 mg/ℓ
Total phosphorus (filtered)	Below detection limit	--
Total phosphorus (unfiltered)	0.014 mg/ℓ	0.005 mg/ℓ
Volatile suspended solids	3.0 mg/ℓ	2.8 mg/ℓ
Carotenoids	3.7 mg/m^3	1.6 mg/m^3
Ammonia nitrogen	0.05 mg/ℓ	0.03 mg/ℓ

Table 11

Poststocking Data Compilation

Sampling Sta 157435

Parameter	Mean Value	Standard Deviation
Temperature	24.2°C	4.7°C
Conductivity	216 μmho/cm	4 μmho/cm
Alkalinity	32 mg/ℓ	1.9 mg/ℓ
Hardness	64 mg/ℓ	4.4 mg/ℓ
Calcium	16 mg/ℓ	1.7 mg/ℓ
Sodium	16 mg/ℓ	0.9 mg/ℓ
Potassium	4.6 mg/ℓ	0.2 mg/ℓ
Magnesium	5.7 mg/ℓ	0.1 mg/ℓ
Secchi disk	2.6 m	0.8 m
Organic nitrogen	0.57 mg/ℓ	0.23 mg/ℓ
BOD	1.1 mg/ℓ	0.4 mg/ℓ
COD	19 mg/ℓ	6 mg/ℓ
Total solids	129 mg/ℓ	9 mg/ℓ
Total phosphorus (filtered)	Below detection limit	--
Total phosphorus (unfiltered)	0.015 mg/ℓ	0.009 mg/ℓ
Volatile suspended solids	2.7 mg/ℓ	2.6 mg/ℓ
Carotenoids	3.9 mg/m^3	1.4 mg/m^3
Ammonia nitrogen	0.06 mg/ℓ	0.02 mg/ℓ

Table 12

Poststocking Data Compilation

Sampling Sta 132497

Parameter	Mean Value	Standard Deviation
Temperature	24.7°C	4.6°C
Conductivity	261 µmho/cm	9 µmho/cm
Alkalinity	43 mg/ℓ	1.1 mg/ℓ
Hardness	85 mg/ℓ	3.5 mg/ℓ
Calcium	18 mg/ℓ	1.3 mg/ℓ
Sodium	17 mg/ℓ	1.2 mg/ℓ
Potassium	5.5 mg/ℓ	0.2 mg/ℓ
Magnesium	9.8 mg/ℓ	0.2 mg/ℓ
Secchi disk	1.8 m	0.6 m
Organic nitrogen	0.75 mg/ℓ	0.28 mg/ℓ
BOD	1.5 mg/ℓ	0.5 mg/ℓ
COD	22 mg/ℓ	7 mg/ℓ
Total solids	160 mg/ℓ	6 mg/ℓ
Total phosphorus (filtered)	0.012 mg/ℓ	0.006 mg/ℓ
Total phosphorus (unfiltered)	0.019 mg/ℓ	0.007 mg/ℓ
Volatile solids solids	3.8 mg/ℓ	3.9 mg/ℓ
Carotenoids	8.6 mg/m^3	6.6 mg/m^3
Ammonia nitrogen	0.07 mg/ℓ	0.03 mg/ℓ

Table 13

Poststocking Data Compilation

Lake Conway*

Parameter	Mean Value	Standard Deviation
Temperature	24.1°C	4.5°C
Conductivity	223 μmho/cm	5 μmho/cm
Alkalinity	32 mg/ℓ	1.6 mg/ℓ
Hardness	65 mg/ℓ	4.0 mg/ℓ
Calcium	16 mg/ℓ	1.5 mg/ℓ
Sodium	17 mg/ℓ	1.0 mg/ℓ
Potassium	4.7 mg/ℓ	0.2 mg/ℓ
Magnesium	6.4 mg/ℓ	0.2 mg/ℓ
Secchi disk	2.4 m	0.5 m
Organic nitrogen	0.54 mg/ℓ	0.18 mg/ℓ
BOD	1.2 mg/ℓ	0.4 mg/ℓ
COD	18 mg/ℓ	9 mg/ℓ
Total solids	132 mg/ℓ	13 mg/ℓ
Total phosphorus (filtered)	0.011 mg/ℓ	0.002 mg/ℓ
Total phosphorus (unfiltered)	0.015 mg/ℓ	0.006 mg/ℓ
Volatile suspended solids	2.8 mg/ℓ	2.9 mg/ℓ
Carotenoids	4.3 mg/m^3	1.9 mg/m^3
Ammonia nitrogen	0.07 mg/ℓ	0.03 mg/ℓ

* Based on data collected at all 11 sampling stations.

Table 14

Poststocking Data Compilation

Dissolved Oxygen, mg/ℓ

Station No.	Surface $\bar{X}$	Surface SD	Middepth $\bar{X}$	Middepth SD	Bottom $\bar{X}$	Bottom SD
400117	7.8	0.9	7.7	0.9	7.7	0.8
282197	7.9	1.1	7.8	1.1	7.5	0.9
210302	8.3	0.9	8.2	0.9	8.1	1.1
415312	8.2	1.1	8.1	0.9	7.7	1.2
332385	8.1	0.8	ND	ND	7.8	0.9
380455	7.9	0.9	ND	ND	ID	ID
415532	7.9	0.9	7.7	1.0	7.2	1.1
212495	8.0	1.0	7.9	1.1	8.0	1.2
195382	8.0	0.9	7.9	1.1	7.9	1.1
157435	8.0	0.7	7.6	0.6	7.8	0.8
132497	8.2	0.8	8.2	1.1	6.9	2.3
Lake Conway	8.0	0.9	7.9	1.0	7.7	1.1

Note: $\bar{X}$ = average; SD = standard deviation; ID = insufficient data; and ND = no data.

Table 15

Poststocking Data Compilation

pH

Station No.	Surface $\bar{X}$	Surface SD	Middepth $\bar{X}$	Middepth SD	Bottom $\bar{X}$	Bottom SD
400117	7.4	0.2	7.4	0.2	7.3	0.2
282197	7.4	0.2	7.4	0.2	7.3	0.2
210302	7.8	0.3	7.8	0.3	7.6	0.2
415312	7.7	0.3	7.8	0.2	7.5	0.4
332385	7.6	0.3	ND	ND	7.8	0.3
380455	7.3	0.1	ID	ID	ID	ID
415532	7.3	0.2	7.3	0.2	7.1	0.3
212495	7.4	0.1	7.4	0.2	7.4	0.2
195382	7.4	0.2	7.4	0.3	7.3	0.2
157435	7.4	0.1	7.3	0.3	7.3	0.2
132497	7.8	0.4	8.0	0.2	7.5	0.5
Lake Conway	7.5	0.2	7.5	0.3	7.4	0.3

Note: $\bar{X}$ = average; SD = standard deviation; ID = insufficient data; and ND = no data.

Table 16

Poststocking Data Compilation

Turbidity, FTU

Station No.	Surface $\bar{X}$	Surface SD	Middepth $\bar{X}$	Middepth SD	Bottom $\bar{X}$	Bottom SD
400117	1.1	0.4	ND	ND	1.3	0.3
282197	1.3	0.5	ND	ND	1.3	0.4
210302	1.3	0.5	ND	ND	1.2	0.4
415312	1.1	0.3	ND	ND	1.3	0.7
332385	1.3	0.4	ND	ND	ND	ND
380455	1.0	0.3	ND	ND	ND	ND
415532	1.1	0.3	ND	ND	1.1	0.3
212495	1.0	0.3	ND	ND	1.1	0.4
195382	0.9	0.2	ND	ND	1.0	0.3
157435	1.0	0.3	ND	ND	1.2	0.5
132497	2.3	0.9	ND	ND	2.1	0.8
Lake Conway	1.2	0.4	--	--	1.3	0.5

Note: $\bar{X}$ = average; SD = standard deviation; ID = insufficient data; and ND = no data.

Table 17

Poststocking Data Compilation

Chlorophyll-a, mg/m^3

Station No.	Surface $\bar{X}$	Surface SD	Middepth $\bar{X}$	Middepth SD	Bottom $\bar{X}$	Bottom SD
400117	5.5	2.1	ND	ND	5.7	2.3
282197	6.1	2.9	ND	ND	6.3	2.5
210302	6.0	2.4	ND	ND	5.8	2.3
415312	5.5	1.7	ND	ND	6.6	4.1
332385	6.0	1.9	ND	ND	ND	ND
380455	6.3	2.5	ND	ND	ND	ND
415532	7.1	2.6	ND	ND	7.3	2.9
212495	6.5	2.4	ND	ND	6.8	2.5
195382	5.8	2.1	ID	ID	5.5	2.2
157435	6.2	2.0	ND	ND	6.9	2.2
132497	14.8	11.2	ND	ND	14.3	10.3
Lake Conway	6.9	3.1	--	--	7.2	3.5

Note: $\bar{X}$ = average; SD = standard deviation; ID = insufficient data; and ND = no data.

Table 18

Poststocking Data Presentation

Sediment Quality

Date	Station No.	Total Nitrogen mg/g	Total PO_4-P mg/g	Cu µg/g	Pb µg/g	COD mg/g	Fe µg/g	Mn µg/g
10-8-79	400117	1.5	0.18	16	31	37	275	5
1-15-80	400117	0.9	0.22	7	15	39	145	4
4-7-80	400117	6.8	0.43	65	17	191	820	31
7-7-80	400117	14.0	0.08	130	--	428	3300	40
10-8-79	282197	0.6	0.10	5	12	37	135	4
1-15-80	282197	2.4	0.34	10	20	82	335	17
4-7-80	282197	0.7	0.12	23	6	21	170	6
7-7-80	282197	0.3	0.13	30	--	13	200	10
10-8-79	210302	2.2	0.36	24	36	66	480	11
1-15-80	210302	4.4	0.29	43	35	162	740	21
4-7-80	210302	3.2	0.20	57	13	114	520	21
7-7-80	210302	8.0	0.32	80	--	241	2000	20
10-8-79	415312	0.9	0.24	7	23	27	190	4
1-15-80	415312	7.5	0.05	30	44	278	880	22
4-7-80	415312	4.7	0.21	43	18	163	660	22
7-7-80	415312	4.6	0.10	50	--	131	1000	10
10-8-79	332385	0.7	0.32	5	21	15	185	5
1-15-80	332385	1.1	0.62	7	15	45	215	5
4-7-80	332385	0.4	0.21	14	2	15	140	4
7-7-80	332385	0.5	0.13	40	--	21	250	10
10-8-79	380455	5.0	0.31	70	62	160	780	11
1-15-80	380455	1.0	0.12	13	9	34	185	5
4-7-80	380455	1.4	0.41	40	2	41	200	3
7-7-80	380455	0.2	0.07	40	--	13	150	10

(Continued)

Table 18 (Concluded)

Date	Station No.	Total Nitrogen mg/g	Total PO_4-P mg/g	Cu µg/g	Pb µg/g	COD mg/g	Fe µg/g	Mn µg/g
10-8-79	415532	20.0	0.19	296	192	604	1860	57
1-15-80	415532	0.3	0.08	6	3	16	155	3
4-7-80	415532	0.5	0.25	30	1	18	110	4
7-7-80	415532	23.0	0.13	390	--	675	2900	70
10-8-79	212495	0.8	0.11	10	21	27	235	4
1-15-80	212495	0.9	0.18	9	9	36	255	5
4-7-80	212495	1.6	0.28	33	4	47	350	10
7-7-80	212495	0.6	0.30	50	--	19	300	10
10-8-79	195382	1.8	0.32	19	36	57	275	5
1-15-80	195382	1.4	0.18	12	9	48	235	5
4-7-80	195382	2.1	0.17	32	3	57	235	7
7-7-80	195382	0.4	0.28	40	--	16	150	10
10-8-79	157435	0.4	0.11	8	12	8	95	3
1-15-80	157435	0.3	0.10	7	9	13	135	4
4-7-80	157435	1.0	0.17	33	1	24	190	4
7-7-80	157435	11.0	0.20	200	--	244	2150	30
10-8-79	132497	0.6	0.09	13	18	21	265	27
1-15-80	132497	0.7	0.21	8	3	26	175	76
4-7-80	132497	0.2	0.09	24	3	7	115	38
7-7-80	132497	0.3	0.14	50	--	6	200	10

Table 19

Poststocking Data Compilation

Sediment Quality

Parameter	Baseline		Poststocking I		Poststocking II		Poststocking III	
	Mean Value	Standard Deviation	Mean Value	Standard Deviation	Mean Value	Standard Deviation	Mean Value	Standard Deviation
Total nitrogen, mg/g	2.66	2.69	3.3	3.4	2.6	3.3	3.2	5.1
Total phosphorus, mg/g	0.44	0.37	0.37	0.21	0.31	0.22	0.21	0.12
Copper, μg/g	13.49	22.60	36.0	48.0	30.0	86.0	48.0	75.0
Lead, μg/g	9.08	13.65	28.0	40.0	14.0	11.0	21.0	34.0
Chemical oxygen demand, mg/g	88.3	99.5	95.0	108.0	82.0	136.0	99.0	149.0
Iron, μg/g	727.0	670.0	817.0	773.0	375.0	562.0	553.0	745.0
Manganese, μg/g	--	--	23.0	23.0	11.0	14.0	16.0	17.0

Table 20

Poststocking Data Presentation

Aquatic Plant Content mg/g

Date	Station No.	Plant Species	Percent Water	COD	PO_4-P	N	Cu*
10-8-79	400117	Nitella	96	945	0.9	29	51
1-15-80	400117	No plants recovered from station					
4-7-80	400117	No plants recovered from station					
7-7-80	400117	No plants recovered from station					
10-8-79	282197	Nitella	91	452	0.7	19	25
10-8-79	282197	Potamogeton	89	978	1.1	18	18
1-15-80	282197	Nitella	96	905	1.3	30	32
4-7-80	282197	Nitella	93	1061	0.7	27	40
7-7-80	282197	Nitella	94	1069	1.2	28	80
7-7-80	282197	Potamogeton	92	1093	1.0	16	100
10-8-79	210302	Nitella	95	978	0.9	33	30
1-15-80	210302	Nitella	96	905	1.9	27	36
4-7-80	210302	Nitella	95	743	1.4	29	57
7-7-80	210302	Nitella	95	982	1.4	32	100
10-8-79	415312	Nitella	97	1026	1.5	37	39
1-15-80	415312	Nitella	94	808	1.2	27	28
4-7-80	415312	Nitella	95	1020	1.0	28	53
7-7-80	415312	Nitella	96	1045	1.6	29	80
7-7-80	415312	Bog moss	95	982	1.6	25	80
10-8-79	332385	Nitella	91	784	0.8	20	21
10-8-79	332385	Potamogeton	89	1107	1.4	21	15
1-15-80	332385	Nitella	95	541	1.6	26	19
1-15-80	332385	Potamogeton	89	1180	1.3	24	9
4-7-80	332385	Nitella	93	800	1.0	21	42
4-7-80	332385	Potamogeton	87	1004	1.1	19	29

(Continued)

* Values for copper reported in μg/g.

(Sheet 1 of 3)

Table 20 (Continued)

Date	Station No.	Plant Species	Percent Water	COD	PO_4-P	N	Cu
7-7-80	332385	Nitella	89	871	0.6	21	90
7-7-80	332385	Potamogeton	89	1228	1.2	16	90
10-8-79	380455	Vallisneria	93	1026	1.0	22	15
10-8-79	380455	Potamogeton	89	768	0.8	18	19
10-8-79	380455	Nitella	94	848	1.1	25	28
10-8-79	380455	Naiad	90	978	0.7	16	12
1-15-80	380455	Potamogeton	89	1180	1.2	21	17
4-7-80	380455	Nitella	94	1061	1.3	33	52
4-7-80	380455	Potamogeton	89	1036	1.4	23	35
4-7-80	380455	Vallisneria	92	955	1.0	22	35
7-7-80	380455	Potamogeton	92	1140	1.3	24	70
10-8-79	415532	No plants recovered from station					
1-15-80	415532	Vallisneria	94	1034	1.7	25	33
4-7-80	415532	No plants recovered from station					
7-7-80	415532	Hydrilla	87	705	1.4	20	150
10-8-79	212495	No plants recovered from station					
1-15-80	212495	Vallisneria	94	1050	1.4	27	20
4-7-80	212495	Naiad	89	395	1.3	22	53
4-7-80	212495	Vallisneria	93	979	1.0	27	54
7-7-80	212495	Vallisneria	93	935	1.7	21	100
10-8-79	195382	Nitella	96	994	1.1	30	30
10-8-79	195382	Vallisneria	94	1010	1.0	27	20
1-15-80	195382	Nitella	95	970	1.1	25	27
1-15-80	195382	Vallisneria	93	1002	1.4	25	22
4-7-80	195382	Nitella	95	873	1.3	32	49
4-7-80	195382	Vallisneria	92	963	1.1	25	33
7-7-80	195382	Nitella	95	1061	0.9	19	90
7-7-80	195382	Vallisneria	92	911	1.0	18	90

(Continued)

Table 20 (Concluded)

Date	Station No.	Plant Species	Percent Water	COD	PO_4-P	N	Cu
10-8-79	157435	Vallisneria	94	962	1.5	25	17
10-8-79	157435	Nitella	96	1091	1.2	34	29
1-15-80	157435	Nitella	96	856	1.3	28	27
1-15-80	157435	Vallisneria	93	905	0.9	20	19
4-7-80	157435	Nitella	91	--	0.6	28	60
4-7-80	157435	Vallisneria	92	938	1.5	24	42
7-7-80	157435	Nitella	92	523	0.8	19	100
7-7-80	157435	Vallisneria	94	982	1.2	17	90
10-8-79	132497	No plants recovered from station					
1-15-80	132497	No plants recovered from station					
4-7-80	132497	No plants recovered from station					
7-7-80	132497	No plants recovered from station					

(Sheet 3 of 3)

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Miller, H. Douglas
Large-scale operations management test of use of the white amur for control of problem aquatic plants : Report 4 : Third year poststocking results : Volume VI : The water and sediment quality of Lake Conway, Florida / by H. Douglas Miller, James Boyd (Miller & Miller, Inc.). -- Vicksburg, Miss. : U.S. Army Engineer Waterways Experiment Station ; Springfield, Va. : available from NTIS, 1983.
28, [23] p. : ill. ; 27 cm. -- (Technical report ; A-78-2, Report 4, Volume 6)
Cover title.
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At head of title: Aquatic Plant Control Research Program.

1. Aquatic biology. 2. Aquatic weeds. 3. Conway, Lake (Fla.) 4. Weed control--Biological control.

Miller, H. Douglas
Large-scale operations management test of use : ... 1983.
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I. Boyd, James. II. United States. Army. Corps of Engineers. Jacksonville District. II. United States. Army. Corps of Engineers. Office of the Chief of Engineers. III. Aquatic Plant Control Research Program. IV. U.S. Army Engineer Waterways Experiment Station. Environmental Laboratory. V. Title VI. Series: Technical report (U.S. Army Engineer Waterways Experiment Station) ; A-78-2, Report 4, Volume 6.
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